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Fujiwara

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(54) **PRINTING PRESS HAVING PLATE SUPPLY DEVICE WITH AXIALLY MOVABLE SUCKER**

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B41F 27/12 (2006.01)

(52) **U.S. Cl.** **101/477**; 101/415.1; 101/481

(58) **Field of Classification Search** ..... 101/415.1, 101/477, 479, 480, 216, 378, 481, DIG. 36
See application file for complete search history.

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JP 2844231 B 10/1999
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(57) **ABSTRACT**

A printing press can securely supply a printing plate while bringing a printing plate into alignment with a plate cylinder in an axial direction of the plate cylinder, as well as omitting the necessity to return the plate registration of the plate cylinder to the original point. The printing press includes a printing plate guide plate that is pivotally movably mounted in an opening of a body cover that covers the plate cylinder, a sucker for holding a printing plate by suction so as to pull the same towards the printing plate guide plate. The sucker is disposed so as to be movable towards a clamping gripper disposed on the plate cylinder and in a direction parallel to an axis of the plate cylinder.

3 Claims, 10 Drawing Sheets

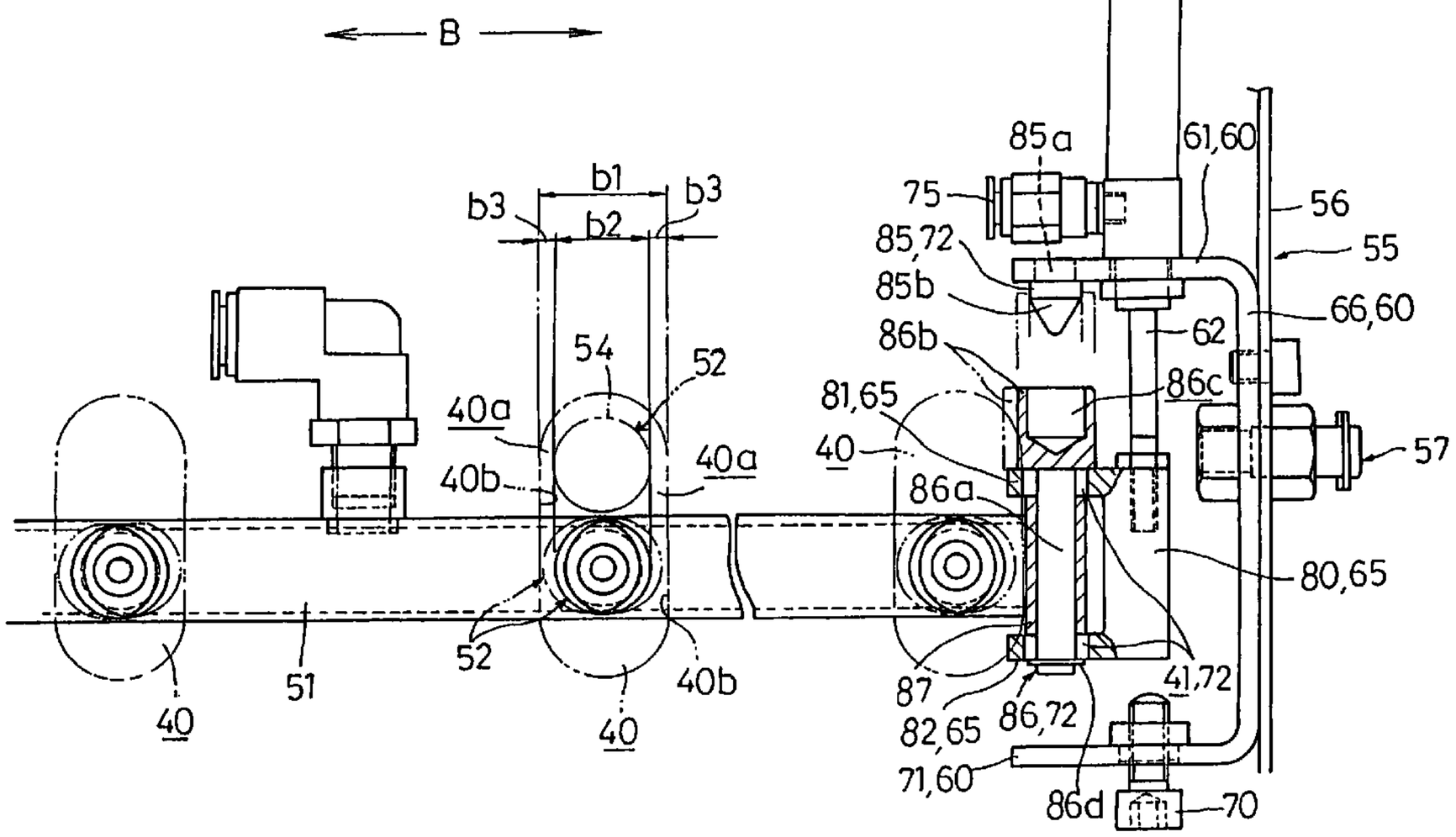
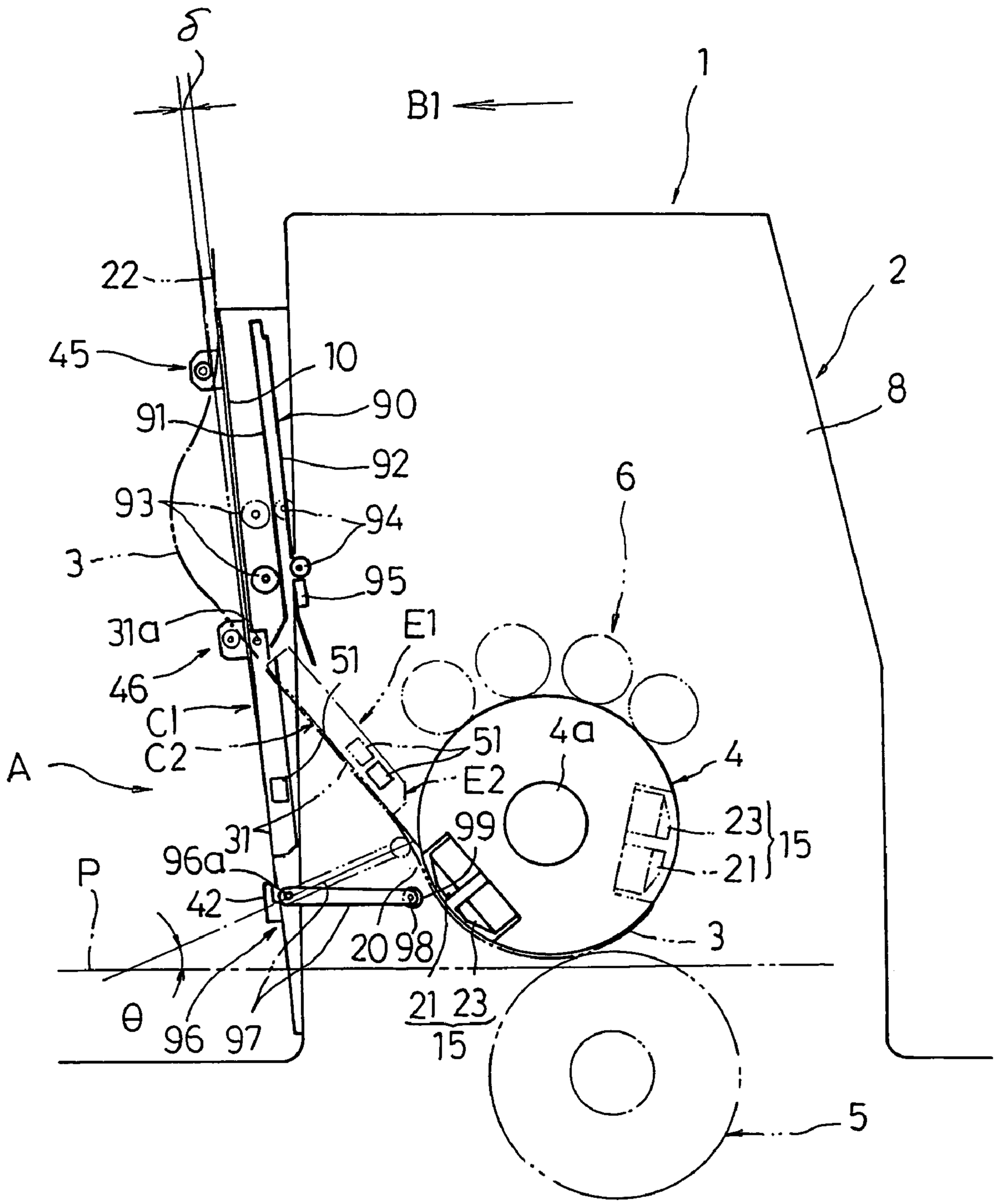


FIG. 1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6
93
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3
95
E1
31a
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46
C1
C2
51
4a
4
A
E2
99
23
15
21
31
96a
P
42
20
98
3
θ
96
97
21
23
15
5

FIG. 2

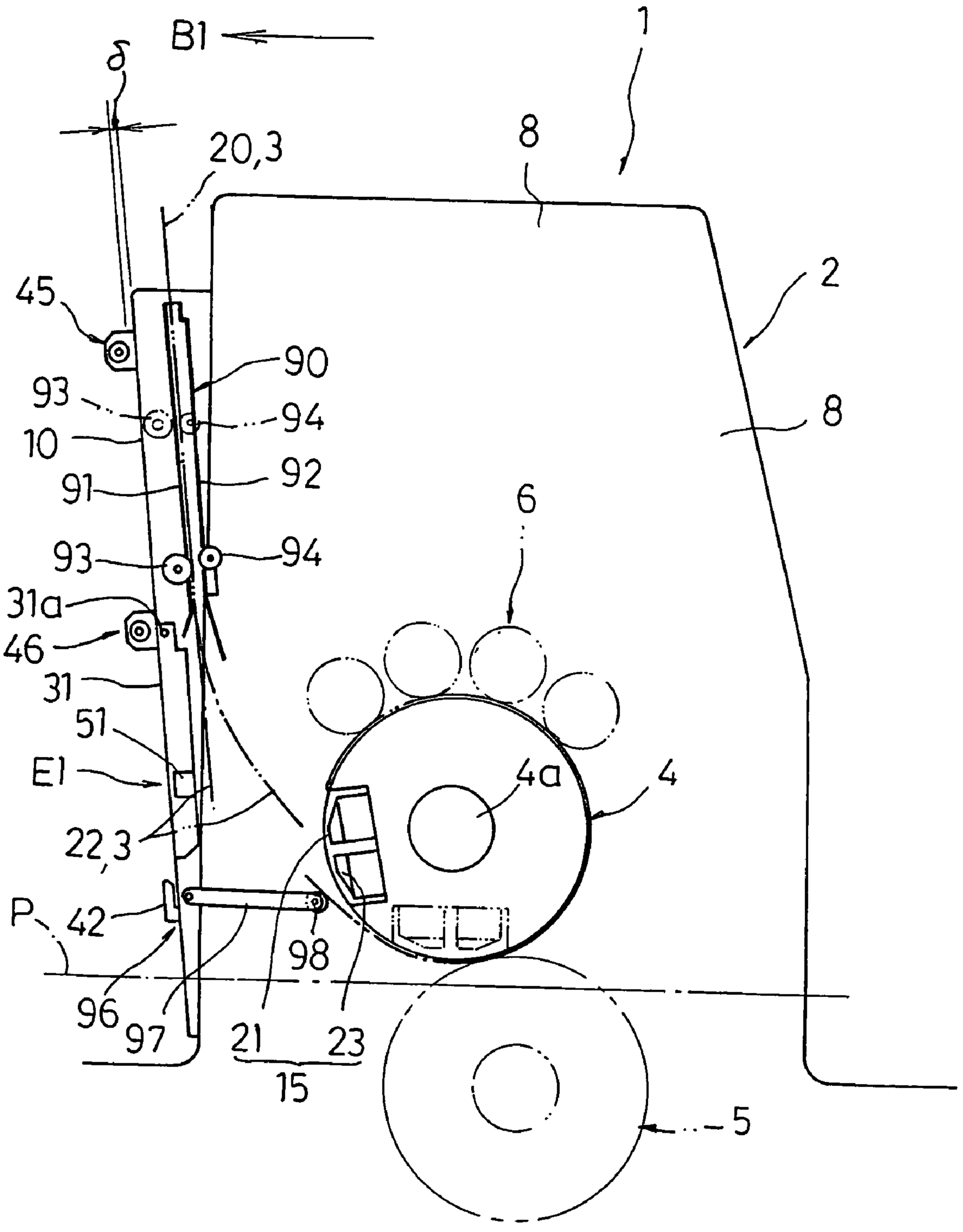
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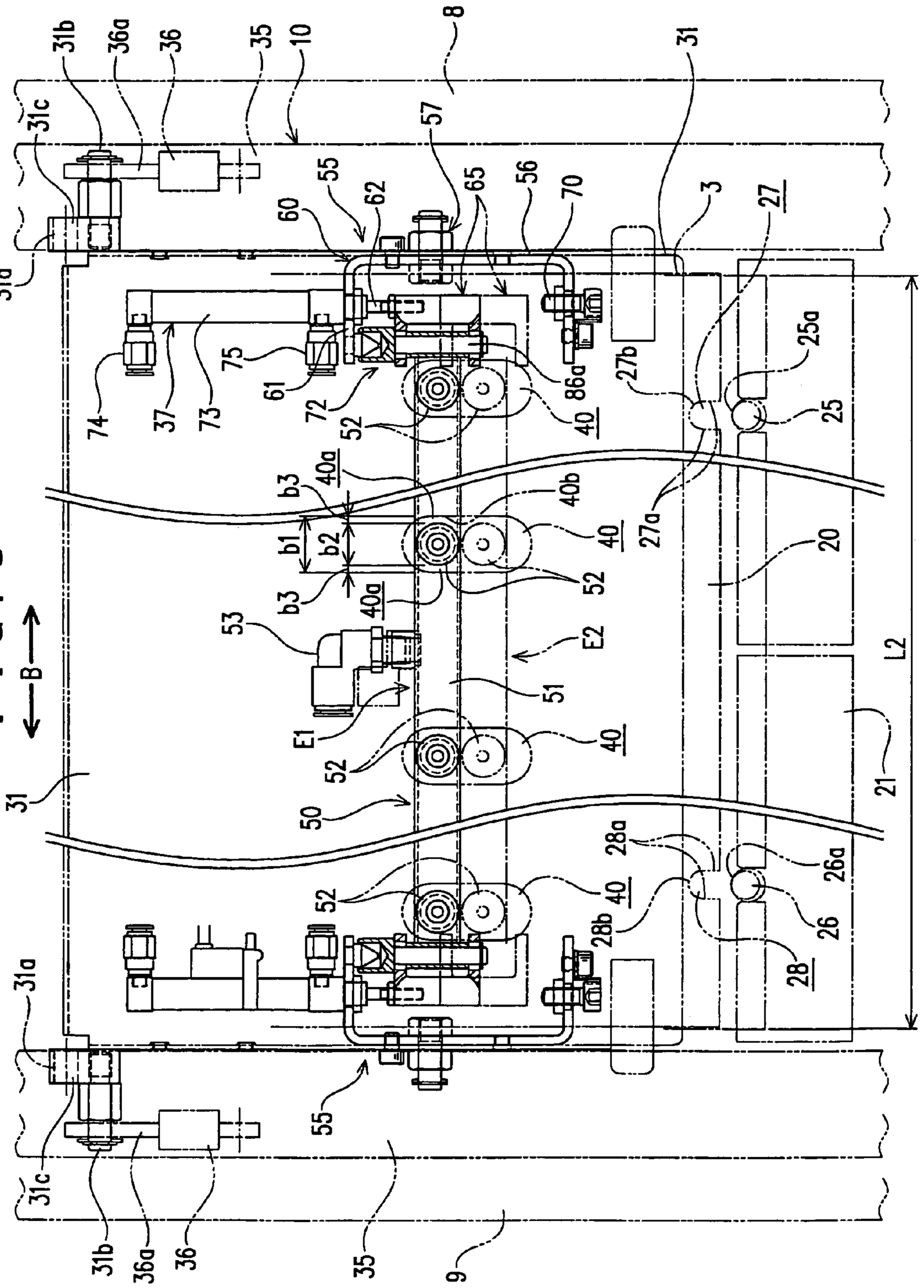
FIG. 3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36a
36
35
10
8
31
31c
57
55
62
65
56
70
3
27
60
31a
75
74
37
73
61
72
86a
27b
25a
25
52
40
40a
40b
27a
b3
b1
b2
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53
E2
51
E1
L2
21
50
28a
26a
28b
26
28

FIG. 4

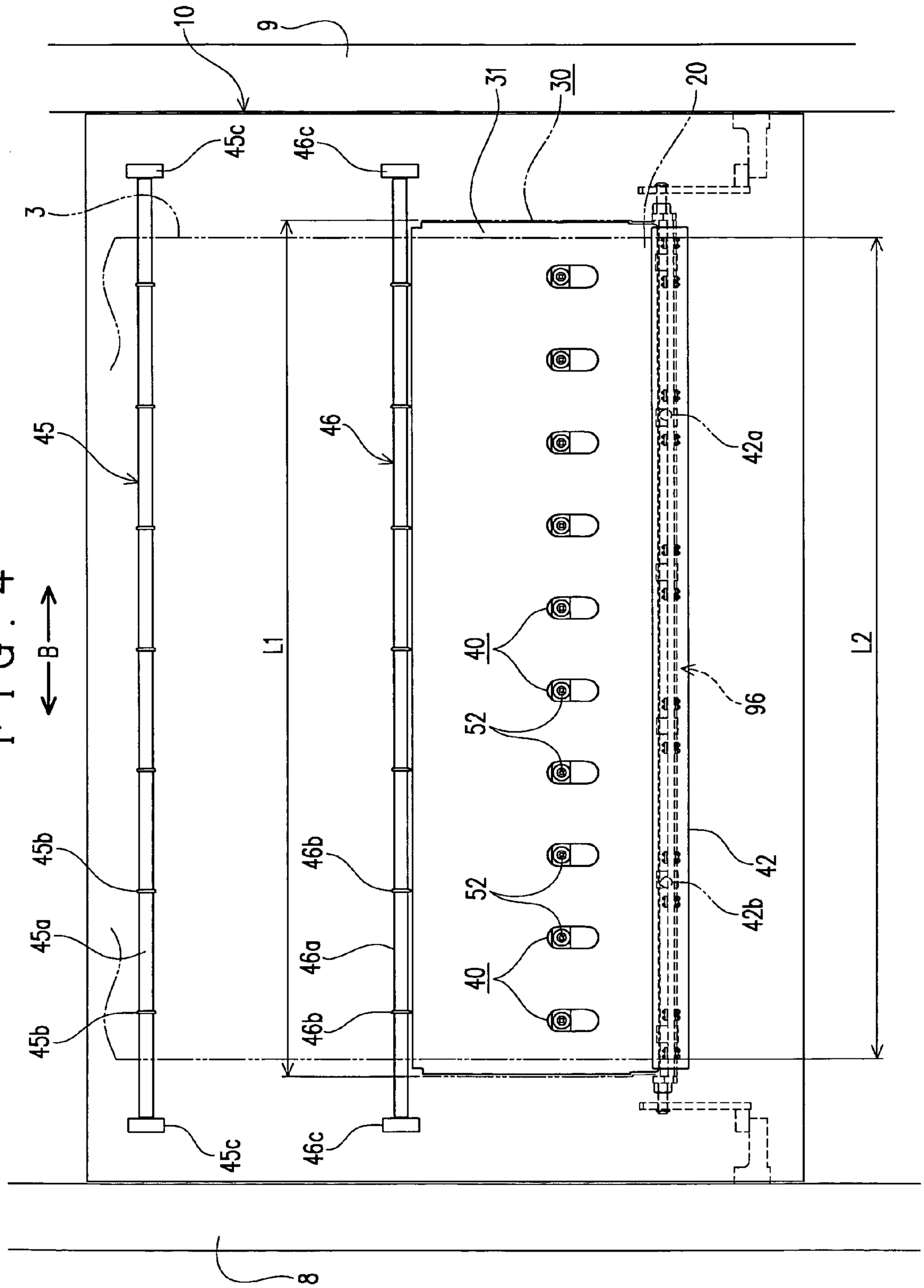
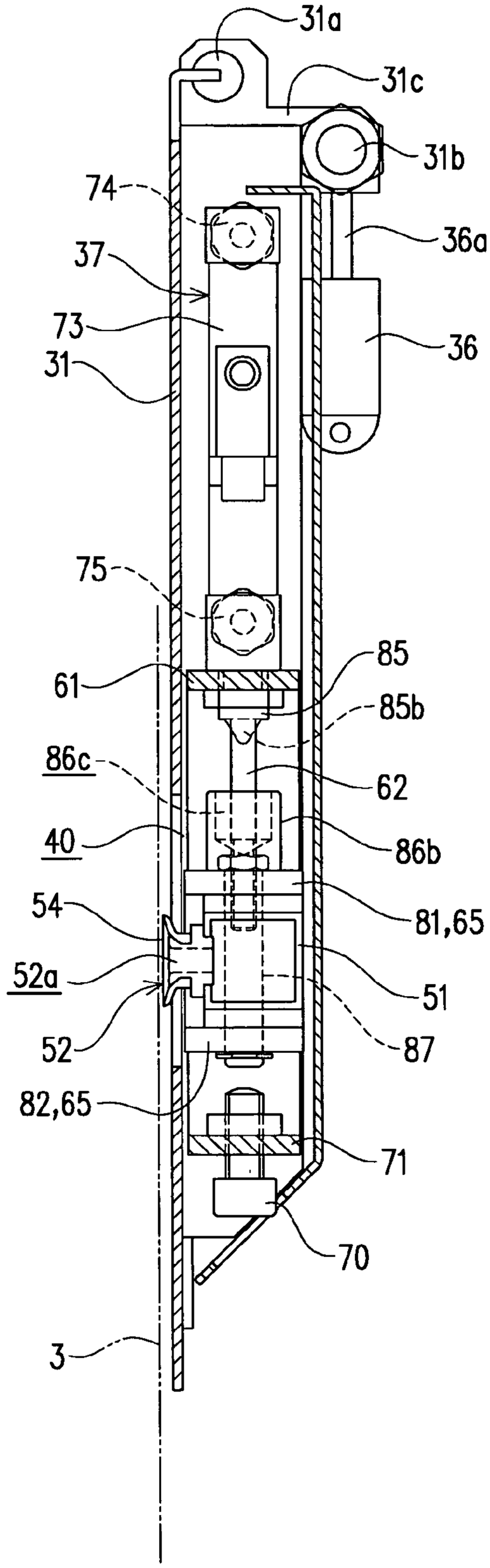

10
9
31
30
20
45c
46c
3
45
46
L1
40
52
96
42a
L2
42
42b
45b
45a
46b
46a
45c
46c
8

FIG. 5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81,65
52a
51
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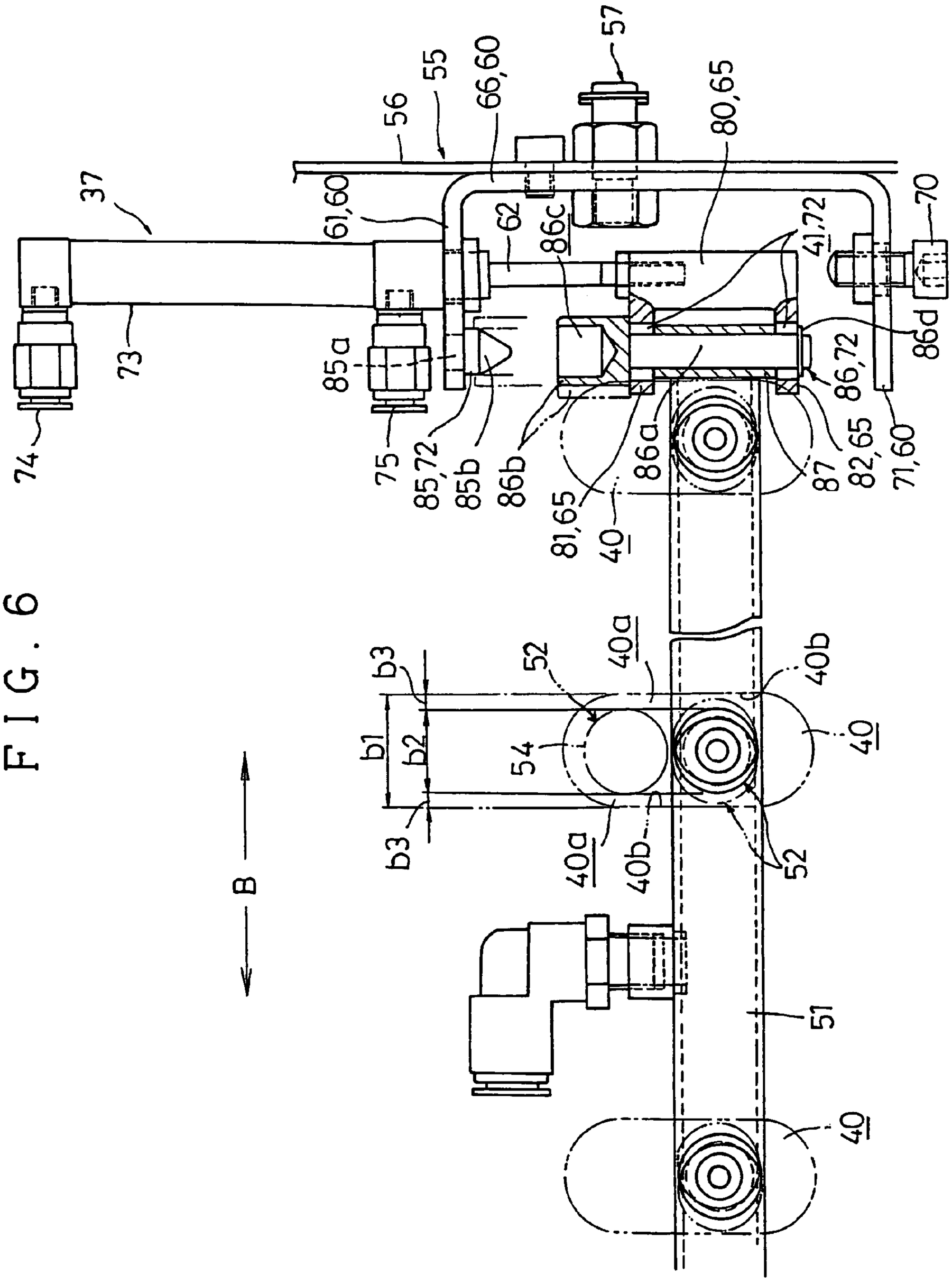
82,65
71
70
3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73
85a
74
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85,72
85b
86b
86a
81,65
40
87
82,65
71,60
86,72
86d
b3
b1
b2
52
40a
40b
54
51

FIG. 6

FIG. 7

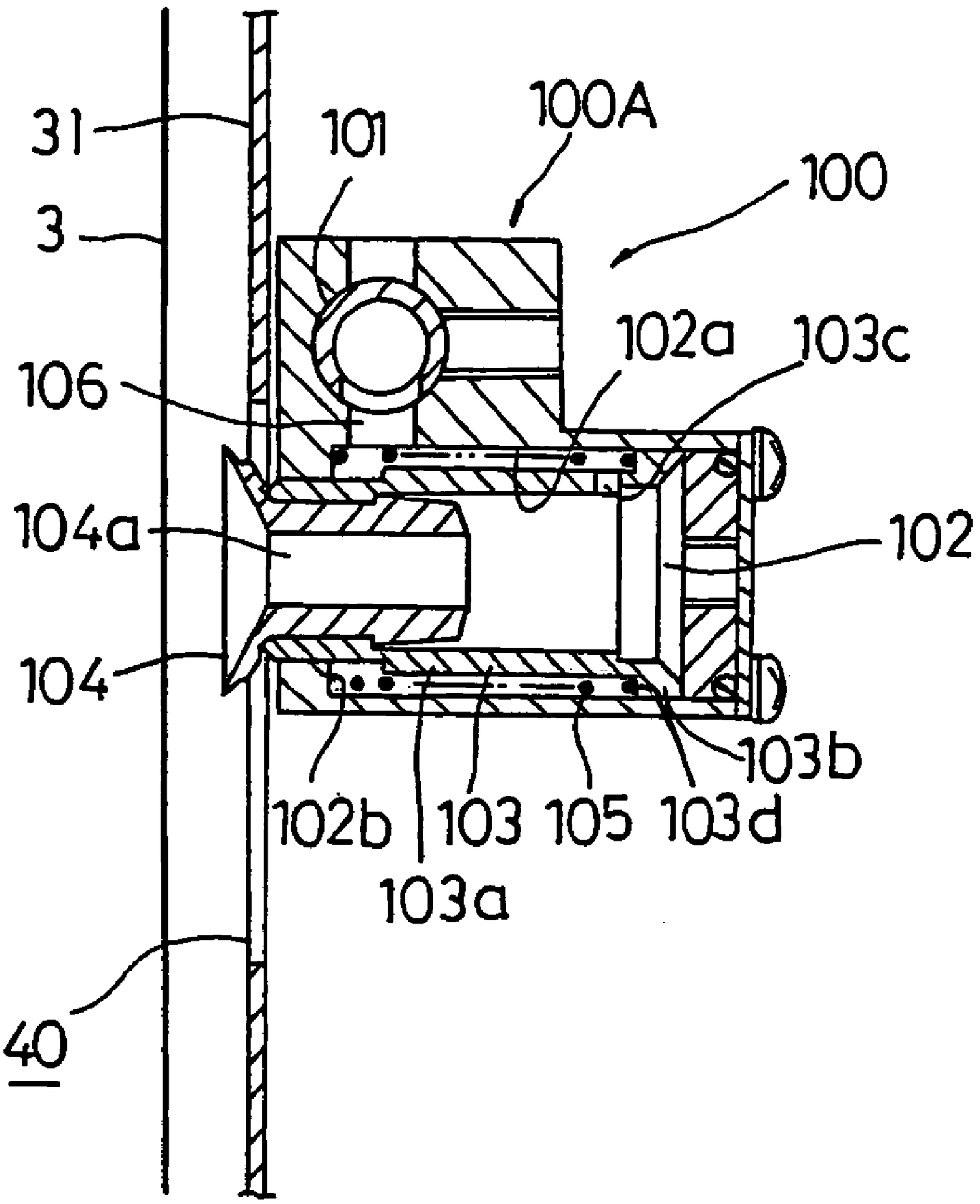

31
3
106
104a
104
40
101
100A
100
102a
103c
102
103b
102b
103
105
103d
103a

FIG. 8

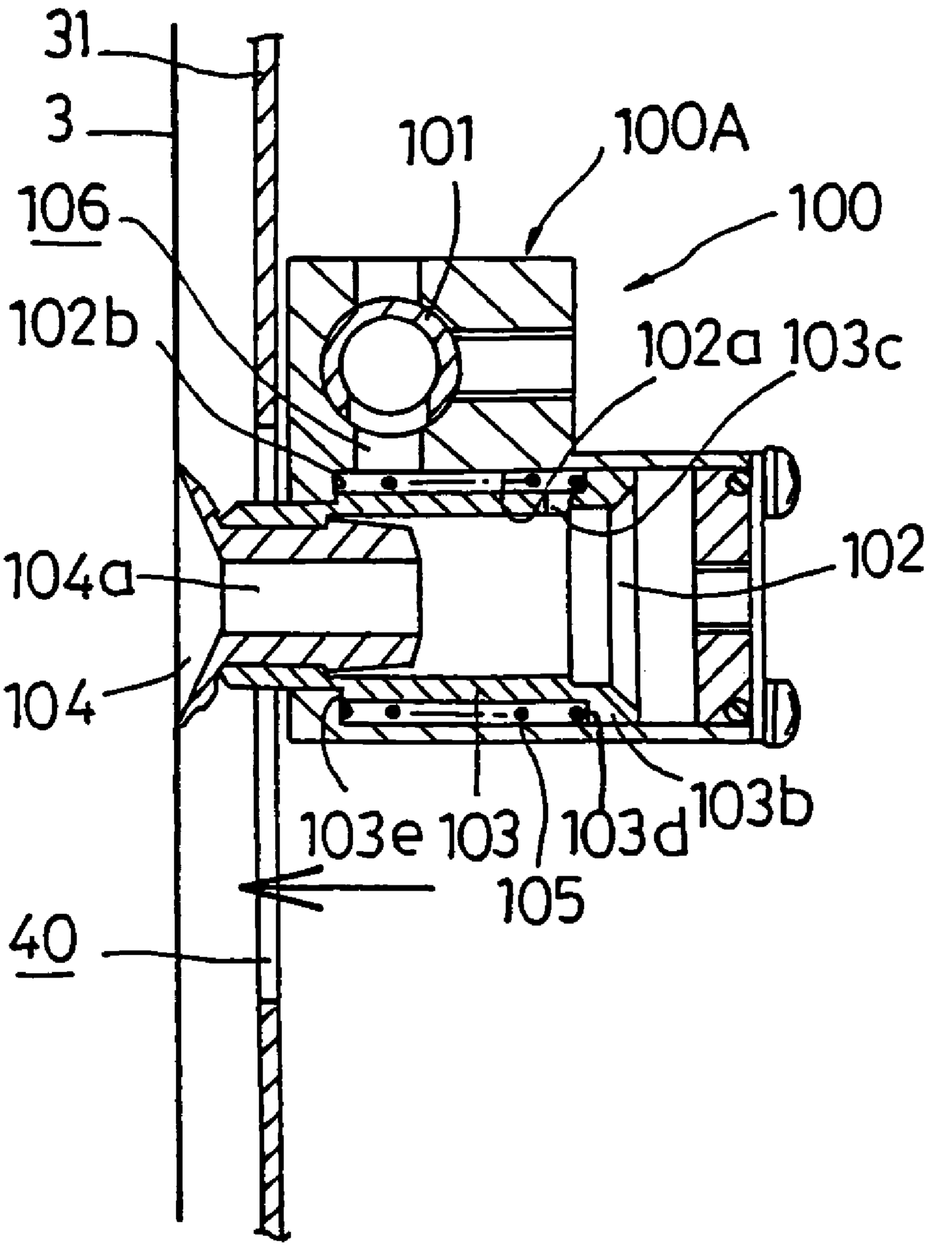

31
3
106
102b
101
100A
100
102a
103c
102
104a
104
103e
103
103d
103b
105
40

FIG. 9

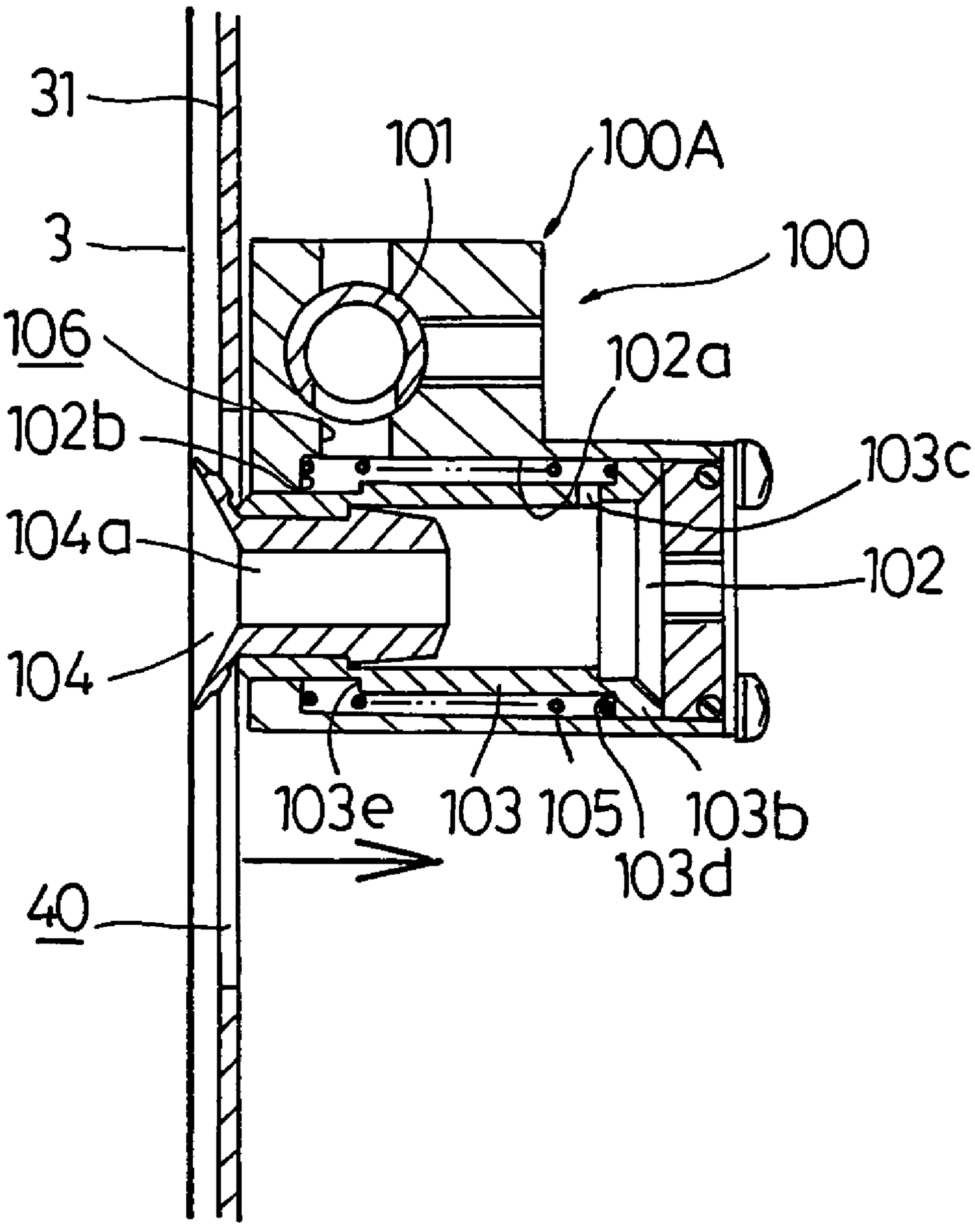
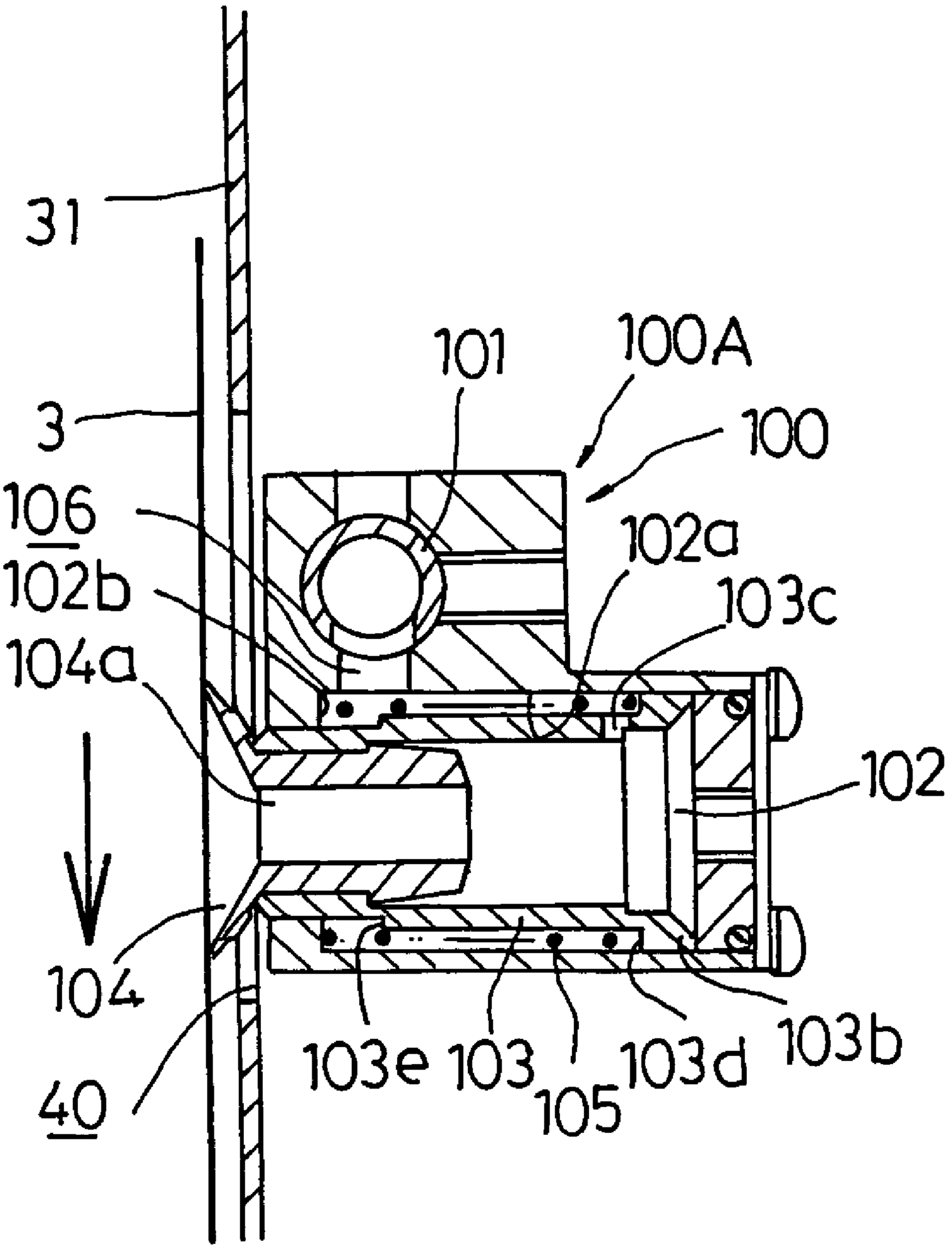

31
3
106
102b
104a
104
40
101
100A
100
102a
103c
102
103e
103
105
103b
103d

FIG. 10


31
3
106
102b
104a
104
40
101
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100
102a
103c
102
103e
103
105
103d
103b

PRINTING PRESS HAVING PLATE SUPPLY DEVICE WITH AXIALLY MOVABLE SUCKER

CROSS REFERENCE TO RELATED APPLICATION

This application claims priority from Japanese Patent Application No. 2004-188023, which is incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a printing press and more particularly a structure of a printing section disposed between a sheet feeding section and a sheet discharge section so as to supply a printing plate to a clamping gripper that is disposed on a plate cylinder and to mount the supplied printing plate on the plate cylinder.

2. Related Art

A sheet-fed printing press (hereinafter referred simply to a printing press) generally includes a printing section between a sheet feeding section and a sheet discharge section. This printing section is to print on sheets by a printing plate mounted on a plate cylinder. There is a necessity to mount a printing plate on the plate cylinder with accurate alignment. For mounting a printing plate on the plate cylinder, the printing press is generally equipped with a printing plate mounting device that automatically mounts a printing plate, which has been manually inserted into a clamping gripper disposed in the plate cylinder. According to a recently proposed printing press, an automatic supply mechanism is employed to automatically supply a printing plate (a new plate), which has been once set at a predetermined position by an operator, to a clamping gripper. For example, Japanese Patent No. 2844231 proposes an automatic plate supply device that has a sucker arranged on a printing plate guide plate disposed on the front side of a body cover of the printing section for sucking a printing plate (plate rear side). According to a technique of this Patent, the printing plate guide plate with the printing plate held by the sucker is inclined towards the clamping gripper of the plate cylinder and the sucker is linearly moved towards the clamping gripper so as to supply the printing plate to the clamping gripper.

Meanwhile, in supplying each printing plate to the clamping gripper, the printing plate is brought into alignment with the clamping gripper (plate cylinder) by the engagement between a pair of axially spaced apart protrusions as an engaging means formed on the clamping gripper and cutouts as an engaged means formed in each printing plate. In this arrangement, the sucker holds by suction a printing plate which has been laid down on the printing plate guide plate and moves towards the clamping gripper while holding the printing plate. If the printing plate on the printing plate guide plate is axially displaced relative to a given position, the engaged means of the printing plate is unlikely to be in alignment with the engaging means so that, with the printing press of this type, which automatically drives the clamping gripper, a signal generated upon the alignment of a printing plate with the plate cylinder is not output, and hence the clamping gripper cannot be controlledly driven. This makes it impossible to mount the printing plate on the plate cylinder. In order to address this problem, for example, Japanese Utility Model Application Laid-open No. Hei-05-26374 proposes a technique in which a guide piece is arranged on the printing plate guide plate for guiding a printing plate along a lateral side edge thereof so as to bring the engaged means of the printing plate into alignment with the engaging means of the clamping gripper. For achieving this alignment in the printing press of this type, the plate cylinder must be previously returned to a given axial position (original point) proper for a printing plate to be newly supplied, as described in for example Japanese Patent No. 3066614. The returning of a plate registration (the axial position) of the plate cylinder to the original point (position) is required for the reason that if the plate registration (the axial position) of the plate cylinder has been displaced from a proper position after the use of the printing plate for the last printing operation, a newly supplied printing plate for the subsequent printing operation may not match the plate registration (the axial position of the plate cylinder), and as a result, it is not possible to bring the cutouts as the engaged means of the printing plate into engagement with the protrusions as the engaging means of the clamping gripper.

The above conventional printing press is provided with a guide piece arranged on the printing plate guide plate so as to guide a lateral edge of the supplied printing plate. This guide piece is fixed in position on the printing plate guide plate and therefore, if the mounting position of the printing plate guide plate relative to the body cover is not accurate, the alignment of the engaged means with the engaging means may not be possible. Also, as another disadvantage associated with the prior art, it is necessary to perform an additional step of returning the plate registration (axial position) of the plate cylinder to the original point (position) in order to make the cutouts as the engaged means match with the protrusions as the engaging means of the clamping gripper of the plate cylinder.

It is an object of the present invention to provide a printing press that is capable of accurately bringing a printing plate into alignment with the plate cylinder by securely making the engaged means of the printing plate match in position with the engaging means provided on the side of the plate cylinder in supplying the printing plate to the plate cylinder, as well as omitting the necessity to return the plate registration of the plate cylinder to the original point.

SUMMARY OF THE INVENTION

According to the present invention, there is provided a printing press that includes: a plate cylinder for mounting a printing plate thereon; a clamping gripper disposed on said plate cylinder for gripping the printing plate; a printing plate guide plate on which a printing plate to be guided is mounted; a sucker for holding the printing plate by a suction force applied to a rear side of the printing plate so as to pull the printing plate towards the printing plate guide plate; a plate supply device for supplying the printing plate held by the sucker towards the clamping gripper; a support member provided in the plate supply device for movably supporting the sucker in a direction parallel to an axis of the plate cylinder; and engaging means being provided on the side of the plate cylinder for bringing the printing plate held by the sucker into a given position relative to the axis of the plate cylinder by engagement with engaged means formed in a leading edge of the printing plate so as to allow the printing plate to be brought into alignment with the plate cylinder relative to the axis of the plate cylinder.

With the thus structured printing press, when the printing plate held by the sucker is moved towards the clamping gripper disposed on the plate cylinder by using the plate

supply device, the sucker, which is movable in a direction parallel to the axis of the plate cylinder while being supported by the support member, moves the printing plate towards the clamping gripper as adjusting the position of the printing plate in the axial direction of the plate cylinder, thereby allowing the engaged means of the printing plate to come into alignment with the engaging means with accuracy. Further, since the printing plate becomes movable in a direction parallel to the axis of the plate cylinder by making the sucker movable in a direction parallel to the axis of the plate cylinder, it is possible to omit the necessity to return the plate registration (axial position) of the plate cylinder to the original point (position) for bringing the plate cylinder into alignment with a new printing plate to be replaced with a used printing plate.

The printing press preferably further includes a moving member, through which the sucker is mounted to the support member in such a manner as to be movable in a direction parallel to the axis of the plate cylinder, and a switching means for switching the moving member so as to prevent the moving member from being moved in a direction parallel to the axis of the plate cylinder at a position at which the sucker starts holding of the printing plate by suction and allowing the moving member to be movable in a direction parallel to the axis of the plate cylinder at a position which the sucker reaches on its way towards the clamping gripper.

With this arrangement, the sucker is prevented from being moved in a direction parallel to the axis of the plate cylinder at a position, at which the sucker starts holding the printing plate by suction, and therefore is held in stationary position. Thus, it is possible to securely hold the printing plate by suction. Also, the sucker is released from such a stationary state at a position which it reaches on its way towards the clamping gripper by the switching means, allowing the printing plate to be adjusted in a direction parallel to the axis of the plate cylinder and hence the engaged means of the printing plate to be brought into alignment with the engaging means of the plate cylinder.

In the above printing press, the engaging means is preferably comprises in the form of a pair of protrusions, each having a cylindrical column shape disposed with a given distance from each other in a direction parallel to the axis of the plate cylinder, and the engaged means is preferably in the form of a pair of engaged members. At least one of the engaged members is preferably a cutout formed in the leading edge of the printing plate, in which the cutout has a width substantially equivalent to the diameter of a corresponding one of the pair of protrusions.

With this arrangement, in a case where a printing plate to be supplied to the clamping gripper is held at a position displaced from a correct position in the axial direction of the plate cylinder, a lateral side wall of the cutout is pressed by the outer circumference of the corresponding protrusion, thereby allowing the printing plate to be adjusted in position in the axial direction of the plate cylinder while being supplied towards the clamping gripper. These engaging means and engaged means may be varied in structure, arrangement, number, shape or the like, as long as the engaged means is brought into alignment with the positioning member based on the engagement therebetween.

BRIEF DESCRIPTION OF THE DRAWINGS

The above, and other objects, features and advantages of the present invention will become apparent from the detailed description thereof in conjunction with the accompanying drawings wherein.

FIG. **1** is a schematic cross sectional view illustrating the motion of a printing press in a plate supply operation, according to an embodiment of the present invention.

FIG. **2** is a schematic cross sectional view illustrating the motion of the printing press in a plate discharge operation.

FIG. **3** is a rear view of a printing plate guide plate with a plate supply device of the printing press.

FIG. **4** is a front view of a downstream sided front panel of the printing press.

FIG. **5** is a lateral cross sectional view of the downstream sided front plate with the plate supply device.

FIG. **6** is an enlarged view of the plate supply device with a partly broken-out section.

FIG. **7** is a cross sectional view illustrating a suction nozzle of a sucker in a pre-suction state before sucking a printing plate, according to another embodiment of the present invention.

FIG. **8** is a cross sectional view illustrating the suction nozzle of the sucker in a sucking state.

FIG. **9** is a cross sectional view illustrating the suction nozzle of the sucker in a retracted state while holding the printing plate by suction.

FIG. **10** is a cross sectional view illustrating the suction nozzle of the sucker which has been retracted and shifted to a different position while holding the printing plate by suction.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Now, the description will be made for an embodiment of a printing press by taking for example a sheet-fed printing press with reference to the drawings attached hereto. FIGS. **1** and **2** are schematic lateral cross sectional views of a printing section of a sheet-fed printing press. FIG. **3** is a rear view of a printing plate guide plate illustrating the structure of a plate supply device. FIG. **4** is a front view of a downstream sided front plate. FIG. **5** is a lateral cross sectional view illustrating the structure of the plate supply device. FIG. **6** is an enlarged view of a partly broken-out section of FIG. **3**.

Generally, a sheet-fed printing press has a sheet feeding section on the upstream side, a sheet discharge section on the downstream side and a printing section (also called as a printing unit) therebetween. All the Figures attached hereto illustrate the structure of a printing section **1**. In this embodiment, only the single printing section **1** is illustrated for ease of explanation, although plural numbers of printing sections are to be set out between the sheet feeding section and the sheet discharge section according to the number of ink colors to be used for printing.

As illustrated in FIGS. **1** and **2**, the printing section **1** includes a body cover **2**, a plate cylinder **4** disposed inside of the body cover **2** for mounting of a printing plate **3** thereon, an inking device with plural ink rollers **6** for supplying ink to the plate cylinder **4**, and a plate supply device A for supplying the printing plate **3** to the plate cylinder **4**. The plate cylinder **4** is rotatably supported by opposite lateral plates **8**, **9** via a support shaft **4***a*. A reference numeral **5** represents a rubber cylinder (a blanket cylinder) to be held in contact with the plate cylinder in a rotatable manner.

The body cover **2** includes a downstream sided front panel **10** disposed on a downstream side B**1** between the opposite lateral plates **8**, **9**. The downstream sided front panel **10** is mounted between the opposite lateral plates **8**, **9** in such a manner as to be movable in the vertical direction, thereby

enabling closing and opening of the downstream side B1 between the opposite lateral plates **8**, **9**.

The plate cylinder **4** includes a known clamping gripper **15** for gripping the printing plate **3**, which includes a leading-edge clamping member **21** for gripping a leading edge **20** (as a gripper receiving edge) of the printing plate **3** and a trailing-edge clamping member **23** for gripping a trailing edge **22** of the printing plate **3**, both members being disposed in pair in the circumferential direction. As illustrated in FIG. **3**, the leading-edge clamping member **21** has a pair of protrusions **25**, **26** each having a cylindrical column shape disposed with a given distance from each other in an axial direction B of the plate cylinder **4** (hereinafter referred to a width direction B). The leading edge **20** of the printing plate **3** forms cutouts **27**, **28** for engagement with the protrusions **25**, **26**. At least one of the cutouts **27**, **28** has a bottom wall **27***b* or **28***b* of a semi-circular shape having a curvature substantially corresponding to a curvature of an outer circumference **25***a* or **26***a* of the protrusion **25** or **26**, and lateral side walls **27***a*, **28***a* extending straightforward from the opposite ends of each of the bottom walls **27***b*, **28***b*.

As illustrated in FIGS. **3** and **4**, the downstream sided front panel **10** has a lower portion forming an opening **30** of a rectangular shape for insertion of the printing plate **3**. The plate supply device A has a printing plate guide plate **31** for opening and closing the opening **30**. The printing plate guide plate **31** has a width L1 greater than a width L2 of the printing plate **3**. The printing plate guide plate **31** is pivotally movably mounted via a support shaft **31***a* extending between the opposite lateral portions of the rear side of the downstream sided front panel **10**. The downstream sided front panel **10** has lateral portions **35** to which cylinder devices **36** are pivotally movably mounted so as to shift the printing plate guide plate **31** between a printing plate setting position C1 at which the opening **30** is closed with the guide plate **31** and a printing plate supply position C2 at which the guide plate **31** is pivotally moved towards the clamping gripper **15**. A leading end of a rod **36***a* of each cylinder device **36** is mounted to an operation shaft member **31***b* parallel to the width direction B so as to control the position of the printing plate guide plate **31**. This operational shaft member **31***b* is connected via a connection member **31***c* to a support shaft **31***a* that extends parallel to the width direction, around which support shaft **31***a* the printing plate guide plate **31** is pivotally moved. The support shaft **31***a* is pivotally movably mounted to a corresponding one of the lateral portions **35** of the downstream sided front panel **10**. The printing plate guide plate **31** is pivotally moved integrally with the support shaft **31***a* via the connection members **31***c* by moving forward and backward the rods **36***a* upon driving of the cylinder devices **36** so as to be shifted between the printing plate setting position C1 and the printing plate supply position C2. A plate surface of the printing plate guide plate **31** has plural elongated holes **40** extending along the plate surface in a direction orthogonal to the width direction B (hereinafter referred to a vertical direction) and aligned to each other in the width direction B.

The plate supply device A has on the front side of the downstream sided front panel **10** a receiving frame member **42** having a length substantially equal to the width of the printing plate guide plate **31** and located downstream of a lower edge of the opening **30** in an overlapping manner therewith. The receiving frame member **42** has on the side facing the printing plate guide plate **31** a pair of positioning members (protrusions **42***a*, **42***b*) that are engageable with portions (cutouts **27**, **28**) of the printing plate **3**, through which the printing plate **3** is supported in position. Provided between the lower portion of the printing plate guide plate **31** and the receiving frame member **42** is a clearance for allowing the insertion of the leading edge **20** of the printing plate **3** when the opening **30** is closed with the printing plate guide plate **31**. A pair of printing plate guide rods **45**, **46**, which are located in parallel above and below each other, are rotatably mounted via brackets **45***c*, **46***c* on the front upper portion of the downstream sided front panel **10**, both rods being greater in length than the printing plate **3** in the width direction B. These printing plate guide rods **45**, **46** are disposed with a given distance in the vertical direction, each having a clearance of a distance allowing for passing of the printing plate **3** therethrough from the front side of the downstream sided front panel **10**. The printing plate guide rods **45**, **46** each have large diameter portions **45***b*, **46***b*, which are slightly greater in diameter than ordinary diameter portions **45***a*, **46***a* between the opposite ends of the printing plate guide rods **45**, **46**.

The plate supply device A has a sucker **50** for sucking a rear side of the printing plate **3** and holding the printing plate **3**. The sucker **50** is disposed on the rear side of the printing plate guide plate **31**. The sucker **50** includes a suction pipe **51** having a length smaller than the printing plate guide plate **31** in the width direction and plural suction nozzles **52** protruding forward from the suction pipe **51** so as to be respectively inserted into the elongated holes **40**. This sucker **50** is shiftable between a suction position E1 allowing the suction nozzles **52** to be held at the upper portions of the corresponding elongated holes **40** and suck the printing plate **3**, and a plate supply position E2 allowing the suction nozzles **52** with the printing plate **3** sucked therewith to be held at the lower portions of the corresponding elongated holes **40**, that is, held close to the clamping gripper **15**. The suction pipe **51** with opposite ends closed is connected to a suction pump (not shown) via a suction joint **53** connected to a middle portion of the suction pipe **51**.

As illustrated in FIG. **5**, the suction nozzles **52** are mounted to the suction pipe **51** so as to respectively have nozzle ports **54** slightly protruding forward from the printing plate guide plate **31**, and each have at its center a suction hole **52***a* for communication with the suction pipe **51**. As illustrated in FIG. **6**, a width b1 of each elongated hole **40** is larger than a maximum diameter b2 of the nozzle port **54** of the corresponding suction nozzle **52**, so that clearances **40***a* each having a width b3 are provided between opposite circumferential walls **40***b* of the elongated hole **40** and the nozzle port **54**.

A pair of support devices **55** are provided to support the suction pipe **51**, allowing the suction pipe **51** to be reciprocated in the vertical direction, and allowing the same to be reciprocated along the plate surface of the printing plate guide plate **31** in the width direction B. The pair of support devices **55** are mounted at the opposite ends of the sucker **50** in the width direction B on the rear side of the printing plate guide plate **31**. The both support devices **55** have an identical structure, and therefore the description will be made only for one of the support devices **55**. The support device **55** includes a bracket **60** fixed to a bent plate portion **56**, which is formed by bending a lateral portion of the printing plate guide plate **31***a*, with a fixing means **57** in the form of a bolt and a nut, a cylinder device (air cylinder device) **37** as a shifting means fixed to an upper plate portion **61** of this bracket **60**, a support block **65** as a support member fixed to a leading end of a rod **62** of the cylinder device **37**, and a block positioning mechanism **72** provided to the support block **65** and the upper plate portion **61** of the bracket **60**.

The bracket **60** has a mounting portion **66** for allowing itself to be fixed to the bent plate portion **56** via the fixing means **57**, the upper plate portion **61** formed by bending an upper part of the mounting portion **66**, and a lower plate portion **71** formed on the lower part of the mounting portion **66** and having a stopper **70** (hereinafter described), thus forming a reversed C-shape with its left-hand side opened when viewed from the front side. The cylinder device **37** is designed to allow the rod **62** to be vertically reciprocated by having a cylinder portion **73** fixed to the upper plate portion **61** in the vertical direction. Air supply joints **74** and **75** are provided on the lateral sides of the opposite longitudinal ends of the cylinder portion **73**.

The support block **65** has a dimension smaller than the height in the lengthwise direction of the mounting portion **66** of the bracket **60** and disposed between the upper plate portion **61** and the lower plate portion **71**. This support block **65** has a body **80** fixed to the leading end of the rod **62**, and support pieces **81**, **82** respectively disposed on the opposite sides of the body **80** in the lengthwise direction (vertical direction), substantially parallel to the upper and lower plate portions **61**, **71**, thus forming a reversed C-shape with its left-hand side opened when viewed from the front side. The stopper **70** is disposed opposite to the body **80** of the support block **65** in the lengthwise direction so as to have an upper end protruding upward from the lower plate portion **71** towards the body **80** of the support block **65**.

The block positioning mechanism **72** has a protrusion **85** mounted on the upper plate portion **61** of the bracket **60**, a moving member **86** extending through the support pieces **81**, **82** of the support block **65**, and an elongated hole **41** formed in the support pieces **81**, **82** for allowing a shaft portion **86***a* of the moving member **86** to be inserted therein in such a manner as to be movable in the width direction B.

The protrusion **85** has a proximal end **85***a* inserted into the upper plate portion **61** of the bracket **60** and mounted thereto, while the protrusion **85** has a distal end **85***b* having a cone shape with a gradually decreasing diameter. A head **86***b* of the moving member **86** has a diameter larger than the elongated hole **41** and has at its center a recess **86***c* for allowing the distal end **85***b* of the protrusion **85** to be brought into and out of engagement therewith. The moving member **86** has an end provided with a retaining member **86***d* for preventing the shaft portion **86***a* of the moving member **86** from falling from the elongated hole **41**. A corresponding one of the opposite ends of the suction pipe **51** is located between the support pieces **81**, **82** of the support block **65** and is integrally formed with a closing member **87** fitted around the shaft portion **86***a* of the moving member **86** for closing the corresponding one of the opposite ends of the suction pipe **51**. The distal end **85***b* of the protrusion **85** is selectively brought into and out of engagement with the head **86***b* (recess **86***c*) of the moving member **86** so as to make the moving member **86** function as a switching member so that the suction nozzles **52** are held in non-movable manner in a direction parallel to the axis of the plate cylinder **4** at a position at which the suction nozzles **52** start holding the printing plate **3** by suction, and released from such a restricted condition when the printing plate **3** has reached a given position on the way towards the clamping gripper **15**.

The plate supply device A has an auxiliary guide device **96** for guiding the printing plate **3** during the plate supply and discharge operations. The auxiliary guide device **96** includes a pivotally moving plate **97** supported at the opposite axial ends of the downstream sided front panel **10** via a support shaft **96***a*. The pivotally moving plate **97** includes a rod member **98** disposed at its leading end, supply plate guide rollers **99** mounted at intervals on the rod member **98** so as to contact the surface of the printing plate **3** only when the printing plate **3** is to be supplied, and discharge plate guide members (not shown) mounted on the rod member **98** between the adjacent supply plate guide rollers **99** for guiding the printing plate **3** by the contact therewith when the printing plate **3** is to be discharged. The pivotally moving plate **97** is designed to have different tilting angles relative to a horizontal plane P respectively for the plate supply operation and the plate discharge operation by using a link mechanism or the like (not shown). Specifically, the pivotally moving plate **97** is substantially parallel to the horizontal plane P in the plate discharge operation, and is tilted upward by an angle θ relative to the horizontal plane P in the plate supply operation. Thus, the pivotally moving plate **97** is pivotally moved to select whether the supply plate guide rollers **99** are to contact the printing plate **3** or the discharge plate guide members are to contact the printing plate **3** every time the operation is changed from the plate supply operation to the plate discharge operation or vice versa. The reason why such operation is to be made is to prevent ink of the printing plate **3** (used plate) from being attached to the printing plate **3** (new plate) during the plate supply operation. This operation allows ink to be attached only to the discharge plate guide members when in the plate discharge operation, while preventing the same from being attached to the supply plate guide rollers **99**. This makes it possible to prevent ink from being attached to the newly supplied printing plate **3**.

As illustrated in FIGS. **1** and **2**, the printing section **1** has a plate discharge device **90** for discharging the printing plate **3** mounted on the plate cylinder **4** through an upper portion of the downstream sided front panel **10**. The plate discharge device **90** is disposed on the rear upper side of the downstream sided front panel **10** and has a pair of discharge plate guide plates **91**, **92** disposed adjacent to each other, and clamping rollers **93**, **94** for clamping the printing plate **3** from the front and rear sides (opposite sides). The clamping rollers **93**, **94** are disposed so as to be vertically movable by a common air cylinder (not shown) along the discharge plate guide plates **91**, **92**, in which the clamping roller **94** is disposed so as to be vertically movable along the discharge plate guide plates **91**, **92** and be movable towards and away from the clamping roller **93** along with this vertical motion. That is, the clamping roller **94** is spring urged by a spring (not shown) towards the clamping roller **93**. A stay **95** is provided on the downstream sided front panel **10** to keep the clamping roller **94** away from the clamping roller **93** when the clamping roller **94** is located at a lower side.

Now, the description will be made for the mounting operation to mount the printing plate **3** on the plate cylinder **4** in the thus arranged printing section **1**. In this case, the operator inserts the printing plate **3** into a clearance between the front side of the downstream sided front panel **10** and the printing plate guide rod **45** while holding the printing plate guide plate **31** at the printing plate setting position C**1** at which the opening **30** is closed. Then, the printing plate **3** is moved downward so as to be inserted into a clearance between the front side of the downstream sided front panel **10** and the printing plate guide rod **46** and hence has the leading edge **20** inserted between the printing plate guide plate **31** and the receiving frame member **42**. The printing plate **3** is held in position by bringing the cutouts **27**, **28** as the engaged means formed in the leading edge **20** of the

printing plate **3** into engagement with the protrusions **42***a*, **42***b* as the engaging means of the receiving frame member **42**.

Then, the operator operates a suction switch (not shown) to drive the suction pump of the sucker **50**, thereby transmitting a suction force of the suction pump to the respective suction nozzles **52** via the suction pipe **51** so as to suck the rear surface of the printing plate **3**, allowing a portion of the printing plate **3** close to the leading edge **20** to be held along the printing plate guide plate **31**. In this case, the suction pipe **51** is positioned in the upper regions of the elongated holes **40** and therefore the suction nozzles **52** are also held at the suction position E**1** that lies in these upper regions. At this moment, the cylinder device **37** has not yet been driven and therefore has the rod retracted with the distal end **85***b* of the protrusion **85** held in engagement with the head **86***b* (recess **86***c*) of the moving member **86**. This engagement thus prevents the suction nozzles **52** from being moved in the width direction B in the upper regions of the respective elongated holes **40** and therefore allows the suction nozzles **52** to securely hold the printing plate **3** by suction.

Then, the operator operates a plate supply switch (not shown) to stop the leading-edge clamping member **21** at a position at which the leading edge **20** of the printing plate **3** is to be inserted, and subsequently drive the cylinder devices **36** with a periphery of the leading edge **20** of the printing plate **3** held along the printing plate guide plate **31** so that the printing plate guide plate **31**, which has been closing the opening **30** until then, is pivotally moved towards the plate cylinder **4** around the support shaft **31***a* (in an anticlockwise direction of FIG. **1**) and then shifted to the printing plate supply position C**2**. By this motion, the leading edge **20** of the printing plate **3** is moved close to the clamping gripper **15**, specifically the leading-edge clamping member **21**, of the plate cylinder **4**. On the other hand, along with the pivotal motion of the printing plate guide plate **31** towards the plate cylinder **4**, the pivotally moving plate **97** of the auxiliary guide device **96**, which has been substantially horizontally held until then, is pivotally moved by an angle θ relative to the horizontal plane P as represented in phantom lines so as to allow the rod member **98** disposed at the leading end of the pivotally moving plate **97** to move closer to the leading edge **20** on the printing plate guide plate **31**.

Upon the detection of the fact that the printing plate guide plate **31** has been brought into the printing-plate supply position C**2**, the cylinder device **37** is driven to extend the rod **62**, which allows the support block **65** to move towards the stopper **70** along the printing plate guide plate **31** through the body **80** mounted to the rod **62**. On the other hand, the distal end **85***b* of the protrusion **85**, which has been held in engagement with the head **86***b* (the recess **86***c*) of the moving member **86** until then, is released from the engagement with the same, and the sucker **50** is moved to the plate supply position E**2** at which the suction nozzles **52** are positioned in the lower regions of the elongated holes **40**. Then, with the arrangement in which the suction pipe **51** is mounted to the support block **65** via the moving member **86** and the closing member **87**, and the suction nozzles **52** are mounted to the suction pipe **51**, the suction nozzles **52** move to the leading-edge clamping member **21** of the clamping gripper **15** along the elongated holes **40** while holding the printing plate **3** by the suction force when the support block **65** moves towards the stopper **70** along the printing plate guide plate **31**.

When the sucker **50** has moved to the plate supply position E**2** with the printing plate **3** positioned correctly relative to the plate cylinder **4** in the width direction B, the cutouts **27**, **28** formed in the leading edge **20** of the printing plate **3** are respectively engaged with the protrusions **25**, **26** of the leading-edge clamping member **21**. Upon the engagement of the cutouts **27**, **28** of the leading edge **20** of the printing plate **3** with the protrusions **25**, **26** of the leading-edge clamping member **21**, the cylinder device **37** stops further extension of the rod **62** by a load resulting from the engaging force since the suction force of the sucker **50** for holding the printing plate **3** is sufficiently greater than the driving force of the cylinder device **37**. In this state, the leading-edge clamping member **21** is driven to clamp the leading edge **20** of the printing plate **3**.

Thus, with the cutouts **27**, **28** of the printing plate **3** held in engagement with the protrusions **25**, **26** of the leading-edge clamping member **21**, the cylinder device **37** stops before the support block **65** contacts the stopper **70** so that the sucker **50** moves to a given plate supply position E**2** and stops its further movement, even if the support block **65** moves towards the stopper **70** along the printing plate guide plate **31**. However, in such a case where the operator erroneously operates the suction switch when the printing plate **3** is not inserted in the clearance between the front side of the downstream sided front panel **10** and the receiving frame member **42**, the cutouts **27**, **28** of the printing plate **3** do not engage with the protrusions **25**, **26** of the leading-edge clamping member **21** and therefore the rod **62** keeps its extending motion with no load applied to the cylinder device **37**. This extension of the rod **62** of the cylinder device **37** is however stopped by the application of a load to the cylinder device **37**, which results from the contact of the support block **65** with the stopper **70**.

Now, the description will be made for the case where the printing plate **3** is not correctly positioned relative to the plate cylinder **4** in the width direction B. In this case, the cutouts **27**, **28** are out of alignment with the protrusions **25**, **26** in the width direction B and therefore they are unlikely to be engaged with each other. In order to address this problem, the block positioning mechanism **72** is provided at each of the opposite ends of the sucker **50**. That is, the block positioning mechanism **72** at each end has the elongated hole **41** in the support pieces **81**, **82** for allowing the shaft portion **86***a* of the moving member **86** to be inserted thereinto while being movable in the width direction B, and the protrusion **85** is positioned away from the head **86***b* of the moving member **86** so that the moving member **86** is held in such a manner as to be movable along the elongated hole **41** at the plate supply position E**2** of the sucker **50**. That is, until the head **86***b* of the moving member **86** is moved away from the distal end **85***b* of the protrusion **85** upon the driving of the cylinder device **37**, the rod **62** is held in an extension state at a given position, allowing the moving member **86** and the suction nozzles **52** to be released from the engaged state in which they are prevented from being moved in the axial direction and therefore to be movable in the width direction B.

With the thus arranged positioning mechanism **72** provided at each end of the sucker **50**, when the leading edge **20** of the printing plate **3** has been moved towards the leading-edge clamping member **21** at the printing-plate supply position C**2** at which the printing plate guide plate **31** has been pivotally moved towards the clamping gripper **15** so as to open the opening **30**, the cutouts **27**, **28**, which happened to be out of alignment with the protrusions **25**, **26** in the width direction B, are brought into alignment with the same, as long as a slight engagement or only a kind of hooking engagement (not requiring a full engagement) is present between the outer circumferences **25***a*, **26***a* of the

cylindrical protrusions **25**, **26** and the lateral side walls **27***a*, **28***a* of the cutouts **27**, **28**, which engagement causes the protrusions **25**, **26** to press the lateral side walls **27***a*, **28***a* of the cutouts **27**, **28**, thus bringing the cutouts **27**, **28** into alignment with the protrusions **25**, **26** and hence allowing the printing plate **3** to be mounted at a correct position relative to the plate cylinder **4** in the width direction B.

Then, the suction nozzles **52**, which together suck the printing plate **3** and hold the same tightly, allow themselves and the suction pipe **51** to move along with the printing plate **3** towards the leading-edge clamping member **21**, while moving in the width direction B, so that the leading edge **20** of the printing plate **3** is clamped by the driving of the leading-edge clamping member **21**. Meanwhile, it is assumed that, even if the printing plate **3** is not mounted at a correct position relative to the plate cylinder **4** in the width direction B, the displacement therebetween is generally small. Therefore, even with a slight engagement or only a kind of hooking engagement (not requiring a full engagement) between the cutouts **27**, **28** and the protrusions **25**, **26**, the protrusions **25**, **26** can press through their outer circumferences the lateral side walls **27***a*, **28***a* of the cutouts **27**, **28** so that the printing plate **3** can be correctly positioned with respect to the width direction B.

The anticlockwise rotation (FIG. **1**) of the plate cylinder **4** with the leading-edge clamping member **21** driven and having been clamping the leading edge **20** of the printing plate **3** causes the printing plate **3** to be mounted on the plate cylinder **4**. At this moment, the pivotally moving plate **97** is pivotally moved upward by the angle θ relative to the horizontal plane P, and therefore allows the printing plate **3** to be guided along the supply plate guide rollers **99** disposed on the pivotally moving plate **97**. Then, the trailing-edge clamping member **23** of the clamping gripper **15** clamps the trailing edge **22** of the printing plate **3**, allowing the printing plate **3** to be tightly mounted on the plate cylinder **4**. Thus, the printing section is set in a state for starting a printing operation. On the other hand, once the mounting operation of the printing plate **3** on the plate cylinder **4** has been finished, the cylinder device **37** is again driven to have its rod **62** return towards the cylinder portion **73**. Whereby, the sucker **50** entirely moves upward; the suction nozzles **52** return to the suction position E**1** at which they suck the printing plate **3** to be subsequently supplied; the protrusion **85** of the block positioning mechanism **72** at each end of the sucker **50** engages with the head **86***b* of the moving member **86**; and the sucker **50** is entirely fixed in position in such a manner as to be non-movable relative to the width direction B. Substantially at the same time, the printing plate guide plate **31** returns from the printing plate supply position C**2** to the printing plate setting position C**1** by the driving of the cylinder devices **36**. At this moment, the pivotally moving plate **97** returns to its original positions at which it is held in the substantially horizontal orientation.

For discharging the printing plate **3** upon the finish of the printing, the plate cylinder **4** is rotated so as to move the clamping gripper **15** to a given position, and the trailing edge **22** of the printing plate **3** is released from the clamped engagement with the trailing-edge clamping member **23**. Whereby, the trailing edge **22** of the printing plate **3** is removed away from the plate cylinder **4** via the spring force of the printing plate **3** and brought into engagement with the discharge plate guide members of the pivotally moving plate **97** held in the substantially horizontal orientation. Then, the plate cylinder **4** is rotated in the clockwise direction of FIG. **2**, thereby moving a portion of the printing plate **3** subsequent to the trailing edge **22** away from the plate cylinder **4** and hence allowing the trailing edge **22** of the printing plate **3** to be drawn into a space between the discharge plate guide plates **91**, **92**. Then, the leading-edge clamping member **21** releases its clamping engagement with the trailing edge **22** of the printing plate **3** at a given position. Thus, the printing plate **3** with its middle portion clamped from the opposite sides by the clamping rollers **93**, **94** is discharged through the upper portion of the downstream sided front panel **10** to the outside of the body cover **2** upon the vertical motions of the clamping rollers **93**, **94** effected by the driving of the cylinder device.

As described above, in the above embodiment of the present invention, the cylinder device **37** as a moving means has the rod **62** that is moved forward and backward in the plate supply direction and is provided with the support block **65** fixed thereto. The moving member **86** is mounted to the support block **65** in such a manner as to be movable in the width direction B of the plate cylinder **4** and the sucker **50** is mounted to the moving member **86**. Accordingly, even when supplying the printing plate **3**, whose cutouts **27**, **28** being out of alignment with the protrusions **25**, **26** in the width direction B, to the clamping gripper **15** of the plate cylinder **4**, while holding the same by the suction force of the sucker **50**, the printing plate **3** is properly supplied to the clamping gripper **15** of the plate cylinder **4** while being corrected in position relative to the width direction B along with the sucker **50**. These protrusions **25** **26** press through their outer circumferences **25***a*, **26***a* the lateral side walls **27***a*, **28***a* of the cutouts **27**, **28**, allowing the printing plate **3** to be supplied to the leading-edge clamping member **21** while being corrected in position relative to the width direction B. This allows the leading-edge clamping member **21** to clamp the leading edge **20** of the printing plate **3** while holding the printing plate **3** at a correct position. Thus, it is possible to achieve accurate alignment of the printing plate **3** with the plate cylinder **4** during supplying the printing plate towards the clamping gripper **15**.

Meanwhile, a conventional printing press of this type is required to have the plate registration (axial position) of the plate cylinder to the original point (position) for bringing the engaged means of a printing plate and the engaging means of the plate cylinder into alignment with each other. In this respect, according to the above embodiment of the present invention, even if the cutouts **27**, **28** of a printing plate to be supplied to the clamping gripper **15** of the plate cylinder **4** are out of alignment with the protrusions **25**, **26** relative to the width direction B, the printing plate **3** is corrected in position relative to the width direction along with the sucker **50** as it is supplied to the clamping gripper **15** of the plate cylinder **4**. Therefore, it is possible to omit the necessity to perform an additional work such as returning the plate registration (axial position) of the plate cylinder **4** to the original point (position) for bringing the engaged means of a printing plate (a new plate) with the engaging means of the plate cylinder **4**, and thus achieves an efficient printing operation.

The present invention is not necessarily limited to the above embodiment. FIGS. **7**–**10** illustrate another embodiment of the sucker. A sucker **100** as illustrated in these Figures has a casing **100**A supported by the block positioning mechanism **72** having the same structure as that of the above embodiment, a suction pipe **101** extending through the casing **100**A so as to be supported thereby and connected to a suction pump (not shown), plural piston chambers **102** defined by the casing **100**A and held in communication with the suction pipe **101**, cylindrical pistons **103** respectively and slidably fitted in the piston chambers **102**, suction

nozzles **104** respectively mounted to the distal ends of the pistons **103**, and springs **105** for spring-urging the pistons **103** in such a direction as to make the suction nozzles **104** retract.

The piston chambers **102** communicate with the suction pipe **101** via communication holes **106** formed in the middle part of the suction pipe **101**. The piston **103** in each piston chamber **102** has a body portion **103***a* having a diameter smaller than the inner diameter of the piston chamber **102** and a diametrically large portion **103***b* having a diameter substantially equal to the inner diameter of the piston chamber **102** so as to be slidingly engageable with a circumferential wall **102***a* of the piston chamber **102**. The body portion **103***a* has a small hole **103***c*. The maximum diameter of each suction nozzle **104** is smaller than the axial width of the elongated hole **40**. The suction nozzle **104** has in its center a suction hole **104***a* for communication between the piston chamber **102** and the outside thereof. The spring **105** is seated between a circumferential surface **102***b* of the piston chamber **102** close to the suction nozzle **104** and a circumferential surface **103***d* of the diametrically large portion **103***b*. The dimension of the small hole **103***c* is sufficiently smaller than the dimension of the communication hole **106**.

Now, the description will be made for the motion of the sucker **100** when at the suction position E**1** for the suction of the printing plate **3** by taking for example one of the piston chambers **102**. Since the suction pipe **101** communicates with the piston chamber **102** via the communication hole **106**, the piston chamber **102** is put into negative pressure as air is drawn therefrom by driving the suction pump. Since the dimension of the small hole **103***c* is sufficiently smaller than the dimension of the communication hole **106**, the piston **103** is moved in such a direction as to protrude away from the elongated hole **40** (towards a left-hand side of FIG. **7**) against spring force of the spring **105**, and the suction nozzle **104** is also moved in such a direction as to protrude away from the elongated hole **40**. Since a stepped surface **103***e* formed on the outer circumference of the piston **103** contacts the circumferential surface **102***b* during the movement of the piston **103**, the length of the piston **103** away from the elongated hole **40** is limited.

While the dimension of the small hole **103***c* is sufficiently smaller than the dimension of the communication hole **106**, suction of air is made also through the suction hole **104***a* by the suction nozzle **104**, which suction force allows the suction nozzle **104** to hold the printing plate **3**, as illustrated in FIG. **8**. With the printing plate **3** held by the suction nozzle **104**, there is no room from which air can be drawn and hence this causes air pressure within the piston chamber **102** to equal the air pressure within the piston **103**. Accordingly, the piston **103** is moved in such a direction as to be retracted from the elongated hole **40** (towards a right-hand side of FIG. **9**). At this moment, the suction nozzle **104** still holds the printing plate **3** and therefore the printing plate **3** is also pulled towards the elongated hole **40**. The sucker **100** is then moved downward with the printing plate **3** held by the suction nozzles **104**, as illustrated in FIG. **10**. This downward movement allows the sucker **100** to be brought into the suction position E**1**, at which the leading edge **20** of the printing plate **3** is drawn into the leading-edge clamping member **21** of the clamping gripper **15**. Thus, the printing plate **3** can be supplied to the plate cylinder **4**.

According to the above embodiments, the alignment of the printing plate **3** with the plate cylinder **4** is made through the engagement between the engaging means in the form of the protrusions **25**, **26** and the engaged means in the form of the cutouts **27**, **28**, in which the lateral side walls **27***a*, **28***a* of the cutouts **27**, **28** are pressed by the outer circumferences **25***a*, **26***a* of the protrusions **25**, **26** in such a direction as to bring the printing plate **3** into alignment with the plate cylinder **4** relative to the width direction B. These engaging means and engaged means may be varied in structure, arrangement, number, shape or the like, as long as the engaged means is brought into alignment with the engaging means based on the engagement therebetween.

This specification is by no means intended to restrict the present invention to the preferred embodiments set forth therein. Various modifications to the printing press, as described herein, may be made by those skilled in the art without departing from the spirit and scope of the present invention as defined in the appended claims.

What is claimed is:

1. A printing press comprising:

a plate cylinder for mounting a printing plate thereon;

a clamping gripper disposed on said plate cylinder for gripping the printing plate;

a printing plate guide plate on which a printing plate to be guided is mounted;

a sucker for holding the printing plate by a suction force applied to a rear side of the printing plate so as to pull the printing plate towards the printing plate guide plate;

a plate supply device for supplying the printing plate held by the sucker towards the clamping gripper;

a support member provided in the plate supply device for movably supporting the sucker in a direction parallel to an axis of the plate cylinder; and

engaging means being provided on the side of the plate cylinder for bringing the printing plate held by the sucker into a given position relative to the axis of the plate cylinder by engagement with engaged means formed in a leading edge of the printing plate so as to allow the printing plate to be brought into alignment with the plate cylinder relative to the axis of the plate cylinder.

2. The printing press according to claim **1**, further comprising a moving member, through which the sucker is mounted to the support member in such a manner as to be movable in the direction parallel to the axis of the plate cylinder, and a switching means for switching the moving member so as to prevent the moving member from being moved in the direction parallel to the axis of the plate cylinder at a position at which the sucker starts holding of the printing plate by suction and allowing the moving member to be movable in the direction parallel to the axis of the plate cylinder at a position which the sucker reaches on its way towards the clamping gripper.

3. The printing press according to claim **1**, wherein the engaging means comprises a pair of protrusions, each having a cylindrical column shape disposed with a given distance from each other in the direction parallel to the axis of the plate cylinder, and the engaged means comprises a pair of engaged members, at least one of the engaged members being a cutout formed in the leading edge of the printing plate, wherein said cutout has a width substantially equivalent to the diameter of a corresponding one of the pair of protrusions.

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